Many children are coming to our clinics with minor eye affections, usually phlyctenular conjunctivitis. Sometimes these antedate the appearance of tuberculous lymphadenitis or pulmonary disease, while at other times they occur during the course of these; but in a good many they may exist alone, and our experience leads us more and more to believe that an underlying tuberculosis is the etiological factor—an opinion which is gaining wider and wider currency.

Such cases of eye disease should be treated for tuberculosis and not merely locally. Taken in time and put under a modified tuberculosis regimen, they respond well and escape frequently the clinical evidences of more advanced infection. They are frequent in children, and their recognition and handling as tuberculosis constitute prophylactic work of the first order. There are, besides, other children who may exhibit their infection, for a time at least, only by skin eruptions, of which several are now pretty satisfactorily determined as of tuberculous origin. Those who are taken in hand and treated for tuberculosis, and not allowed to go their way after the application of ointments and powders, will again in many cases fall out of the ranks of future consumptives.

The prevention of adult tuberculosis which can be done by quasitherapeutic institutions like the open air school, or schools adapted to the peculiar needs of delicate children, is incalculable; they will repay any amount of development. What children themselves assimilate from such movements as that of the Health Crusaders cannot be estimated; but the conclusion is inescapable that thousands will carry precept and practice, even though imperfectly, through childhood and into later life, and will translate into action and habit, health practices which on occasion will turn the scale in favor of the continuation and permanence of the inactivity of long standing infection.

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THE PREVENTION AND CURE OF RICKETS BY SUNLIGHT

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RICKETS is the commonest nutritional disorder occurring among infants. In spite of this fact little interest has been manifested in it, either by the clinician or by the laboratory investigator. Its status from an etiological point of view was, until recently, much the same as it had been for the past 250 years, from the time when Glisson and his associates recorded its appearance in England. Broadly speaking, it may be stated that physicians have been divided into two camps regarding its origin, some believing the main cause to be dietetic, and others ascribing its occurrence to faulty hygiene.

During the past few years renewed interest has been aroused in the study of rickets, both in this country and abroad, owing to the fact that some have ascribed it to the lack of a vitamine, and also because it has become possible to produce the disease with regularity in animals. Studies, however, have not progressed sufficiently far to harmonize opinions as to its causation. The well known investigations of Mellanby[1] have led him, and others, to the conclusion that the nutri-

tional alterations are due to a deficient diet, the lack of a vitamine identical or closely associated with the fat-soluble vitamine; whereas the work of Findlay and Paton[2]—clinical as well as experimental—have led to the deduction that the disorder is to be ascribed to hygienic factors.

In previous communications I have taken the position that although a faulty diet may lead to the development of rickets, a lack of vitamines is not the dominant cause, for infants develop this disorder in spite of obtaining adequate amounts of these unidentified food factors. Some years ago we went a step further, and attempted to correlate the diet of nursing mothers with the occurrence of rickets in their offspring. A study was made of the diet of the negro mother in New York City,[3] for, as is well known, negro babies are particularly prone to rickets. The result of this investigation may be summarized by the statement that the diet of these mothers was found to be lacking particularly in fresh vegetables.

Defective hygiene may be interpreted in many ways. The majority have understood by this term, a lack of fresh air, an accumulation of poisons due to overcrowding and confinement in poorly ventilated rooms, whereas others, notably Findlay and Paton, have stressed more especially a lack of exercise.

For some time I have been actively interested in the relation of light to the development of rickets. My attention was directed to this aspect of the question on account of the striking seasonal incidence of rickets, which, as you know, occurs with marked frequency during the winter and spring months, decreasing and almost disappearing with the advent of summer. Based on this phenomenon, an attempt was made some years ago to cure rickets by means of the ultraviolet ray. Our results then were inconclusive. More recently Huldschinsky[4] has made use of this therapeutic measure with definite success, using the mercury-vapor quartz lamp. During the past year Dr. Unger and I have been treating cases of mild rickets which developed on the usual diets (ordinary formulas of milk, orange juice, and in the case of older infants, cereals), with frequent short exposures to direct sunlight.[5] The results have been most encouraging. The infants have not only improved in general vigor and nutrition, but the signs of rickets have rapidly disappeared under this treatment. The babies were exposed to the sun for 15 minutes to an hour, first the legs, then the arms, and, when the weather was mild, the chest and back. At all times the period was regulated according to the outdoor temperature as well as to the sensitiveness of the skin of the infant. It is evident that no rule can be formulated in this regard, but that one must be guided by the reaction of the individual child, for example, whether it has a tendency to tan or to burn. The sun's rays must impinge directly on the skin, and not pass through the window pane or be obstructed by the baby's clothing. The treatment was given every day when possible; as a matter of fact, it could be carried out but four to five times a week. It was found, without exception, that the signs of rickets rapidly disappeared under this therapy. The beading of the ribs diminished, the characteristic signs as seen by the X-ray became obliterated, with a definite increasing deposition of inorganic salts at the epiphyses of the long bones. These clinical and radiological manifestations of healing were substantiated by chemical evidence. Recently Howland and Kramer[6] have shown that rickets is accompanied by a diminution of the inorganic phosphates of the blood. Following some weeks of heliotherapy, it was found that the inorganic phosphate content in our cases gradually increased in amount and reached normal.

As stated, rickets can be brought about with regularity in animals. In this country rats have been used for these ex-

periments, in England dogs have been employed. A distinction may be drawn between rickets in animals and in human beings, in that it develops in children on the liberal diets in common use and no one type of diet has been identified with its incidence. Without going into detail of the animal investigations, it may be added that we have found the sun treatment quite as efficacious in the rickets of rats as in infantile rickets. If rats are exposed to the sun's rays for intervals of 15 to 30 minutes daily, they can by this means regularly be protected against rickets, whereas animals fed on the same diet, but kept at all times in the dark, develop rickets in all instances.

DISCUSSION

That rickets can be prevented or cured by sunlight does not imply that light is the only agent to be relied upon as a therapeutic measure. It should not be forgotten that we possess a specific for rickets, that cod liver oil can be relied upon for its prevention or cure. In a study of rickets carried out a few years ago by Dr. Unger and myself among the negro babies of the Columbus Hill district of this city,[7] the efficacy of cod liver oil was clearly demonstrated. As a result of this experience, and that of others, we stated that rickets could be eradicated from New York City by a yearly expenditure of about $100,000 for cod liver oil.

What we wish to emphasize more particularly is rather the prophylaxis against rickets. At the present time it is impossible to state the comparative rôles of dietetic and of hygienic factors in its etiology. Probably their influence varies at different times and under different circumstances. During the war, defective diet, no doubt, was a potent factor in increasing the incidence of rickets in the Central Empires. In New York City I believe that lack of sunlight plays a very important rôle in its development, and I am strengthened in this view by the marked seasonal incidence which it evinces.

Now that it has been shown that sunlight is a valuable preventive and curative measure in rickets, those active in infant welfare will have to regulate the care of the baby so that it is not deprived of this simple and beneficient therapeutic agent. At the present time infants are swathed from head to toe in clothing, so that the sun can fall only upon their faces; even in the mildest weather their bodies receive little direct sunlight. Such habits should be altered. If the baby is in the sun, its arms and legs may be bared without causing discomfort. In cold weather the body must be particularly well wrapped, and the hands and feet protected, but the arms and legs may be exposed.

It is evident that a corollary of the benefits to be derived from sunlight is the need of improving the housing conditions of the poor, and the elimination of the dark tenements which shut out all the sunlight. This gospel is applicable to children's wards in hospitals and child-caring institutions, and should lead them to increase their provision for outdoor treatment, roof wards and solaria. The solaria must not, however, be enclosed in glass, for, although the light and heat rays penetrate glass, a large part of the radiations which cure rickets are lost by the rays traversing the window panes.

The fact that sunlight plays an important rôle in the development of rickets certainly explains, to a large degree, its distribution and the comparative freedom of the children of the tropics and in the countries where an outdoor life is followed. No doubt this is not the only factor involved.

These clinical results, confirmed by laboratory experiments, show that, although we have realized the importance of light in the growth of plant life, we have accorded it too little significance in the development of animal life. We have known that a growing plant cannot thrive in the dark, but have failed to realize that the same laws apply to growing ani-

mals. Infants have been the chief sufferers from this lack of understanding, and the development of rickets one of its unfortunate results.

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Organizing an Anti-Malaria Campaign.—The following outline shows the program for county-wide malaria investigation and control under which the work of the central administration unit of the Alabama State Board of Health has been carried on, with gratifying reductions in morbidity and public expense. Some of the results for 1921 are reported in the State Notes section of the JOURNAL.

This program has the active coöperation of the U. S. Public Health Service and the International Health Board, and may well serve as a suggestive model for other communities where the malaria problem is prominent.

I—Instruction of county health officer by malaria control expert in:

1. Catching and identification of species of mosquitoes, including larvae, pupae and adults.
2. Essentials of drainage, oiling, use of fish and larvicides.
3. Essentials of screening and quinine control.

II—Surveying of and work in communities suitable for work by county health officer and malaria control expert.

1. Organization for work determined by local conditions.
2. Work under supervision of county health officer.
3. Inspected regularly by malaria control expert.

III—Work in rural places by county health officer.

1. Institutions.
2. Farmers.

IV—Educational and publicity work; under control of county health officer, advised and assisted by malaria control expert.

1. Personal conferences, lectures and demonstrations.
2. In schools.
   a. By health officer: demonstrations.
   b. By teacher: use of "Malaria Primer."
3. Exhibits and demonstrations at county fairs, chautauquas, etc.
4. Distribution of literature, placards, etc.
5. Newspaper articles.
6. Work with boys' organizations.

V—Prevention of future man-made Anopheles breeding places.

1. By coöperation with railroads.
2. By coöperation with county officials and road builders.
3. By coöperation with farmers and manufacturers.

VI—Promotion of drainage districts, and tying up of malaria with large agricultural drainage projects.

VII—Collection of malaria and mosquito statistics by the county health officer.

1. From doctors: reports and statements.
2. From officials: statements.
3. From school children: statements, possibly spleen examinations and blood smears.
4. By malarial census in chosen places.
5. By use of "spot map" to indicate relative prevalence in parts of county.

VIII—The state malaria expert and assistants who:

1. Survey each county and advise the county health officers as to what places to control and how to control them.
2. Instruct county health officers in malaria control work.
3. Inspect work in counties regularly.
4. Collect all data and information in counties and from outside and acquaint all health officers with it.
5. Keep records of all work being done throughout state.